REMARKS

The Applicant has received and reviewed the Official Action mailed on 2 May 2006 (the "Action"), and submits this paper as a fully-responsive reply thereto.

On page 2 of the Action, the Office indicated that prosecution of this matter had been re-opened in view of the appeal brief filed by the Applicant on 16 August 2005. The Applicant expresses appreciation for favorable consideration of the appeal brief, and for the detailed analysis presented in the Action.

The Action stated various rejections of the pending claims under 35 U.S.C. § § 101, 112, and 103. The Applicant organizes the responses to those rejections under appropriate headings as indicated below.

Rejections under § 101

As stated in Paragraph 2 of the Action, claims 1-22 stand rejected under 35 U.S.C § 101 as being directed to non-statutory subject matter, while also citing MPEP § 2106. The Applicant respectfully traverses these rejections for the reasons below.

The Applicant has reviewed the guidelines provided in MPEP § 2106, and submits that, under those guidelines, claims 1-22 are drawn to statutory subject matter. Only for the sake of brevity, the Applicant has reproduced certain portions of MPEP § 2106 herein as appropriate to support the following discussion.

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Under the heading of "IV. Determine Whether the Claimed Invention Complies with 35 U.S.C. 101", MPEP § 2106 provides guidelines for determining whether a claim is directed to statutory subject matter under § 101. More specifically, sub-section B.1. provides a discussion of "Nonstatutory Subject Matter". A portion of this sub-section is reproduced here, with underlining added for ease of discussion:

"1. Nonstatutory Subject Matter

Claims to computer-related inventions that are clearly nonstatutory fall into the same general categories as nonstatutory claims in other arts, namely natural phenomena such as magnetism, and abstract ideas or laws of nature which constitute "descriptive material." Abstract ideas, *Warmerdam*, 33 F.3d at 1360, 31 USPQ2d at 1759, or the mere manipulation of abstract ideas, *Schrader*, 22 F.3d at 292-93, 30 USPQ2d at 1457-58, are not patentable. Descriptive material can be characterized as either "functional descriptive material" or "nonfunctional descriptive material." In this context, "functional descriptive material" consists of data structures and computer programs which impart functionality when employed as a computer component. ... "Nonfunctional descriptive material" includes but is not limited to music, literary works and a compilation or mere arrangement of data."

Applying the above analytical framework to the case at hand, the Applicant submits that the subject matter recited in claims 1-22 is "functional descriptive material", as that term is used above in the excerpt from MPEP § 2106. More specifically, independent claim 1 is drawn to a "machine-readable medium having a data structure stored thereon ...".

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Continuing the analysis described in MPEP § 2106, the Applicant reproduces the following therefrom, with underlining added:

"Both types of "descriptive material" are nonstatutory when claimed as descriptive material *per se*, *Warmerdam*, 33 F.3d at 1360, 31 USPQ2d at 1759. <u>When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized</u>. Compare *In re Lowry*, 32 F.3d 1579, 1583-84, 32 USPQ2d 1031, 1035 (Fed. Cir. 1994) (claim to data structure stored on a computer readable medium that increases computer <u>efficiency</u> held statutory) and *Warmerdam*, 33 F.3d at 1360-61, 31 USPQ2d at 1759 (claim to computer having a specific data structure stored in memory held statutory product-by-process claim) with *Warmerdam*, 33 F.3d at 1361, 31 USPQ2d at 1760 (claim to a data structure *per se* held nonstatutory). ...."

The Applicant submits that the claims at hand are similar to the claim referenced in *In re Lowry* above. For example, turning to **independent claim 1**, the Applicant notes that claim 1 is drawn to a "machine-readable medium having a data structure stored thereon for *efficiently ordering* a plurality of entities ...".

The discussion now turns to sub-section IV.B.1. of MPEP § 2106, and more particularly to a sub-section (a) thereof, entitled "Functional Descriptive Material: 'Data Structures' Representing Descriptive Material *Per Se* or Computer Programs Representing Computer Listings *Per Se*". A portion is reproduced here, with underlining added for convenience of discussion:

"Data structures not claimed as embodied in computer-readable media are descriptive material *per se* and are not statutory because they are not capable of causing functional change in the computer. See,

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e.g., *Warmerdam*, 33 F.3d at 1361, 31 USPQ2d at 1760 (claim to a data structure *per se* held nonstatutory).

Such claimed data structures do not define any structural and functional interrelationships between the data

structure and other claimed aspects of the invention which permit the data structure's functionality to be

realized. In contrast, a claimed computer-readable medium encoded with a data structure defines structural

and functional interrelationships between the data structure and the computer software and hardware

components which permit the data structure's functionality to be realized, and is thus statutory."

The Applicant submits that claim 1 and all claims depending therefrom are statutory under the foregoing guidelines from MPEP § 2106.

Turning to **independent claims 10 and 19**, without conceding the propriety of the stated § 101 rejections, the Applicant has amended claims 10 and 19 to recite that methods "implemented at least in part by a computing device for removing a particular entity from a plurality of entities as represented in a data structure for efficiently ordering the entities". These amendments apply equally to all claims depending from claims 10 and 19.

In light of the foregoing guidance from MPEP § 2106 and the revisions to claims 10 and 19, the Applicant submits that claims 1-22 are directed to statutory subject matter. The Applicant thus requests reconsideration and withdrawal of the § 101 rejections of claims 1-22, as stated in Paragraph 2 of the Action.

Rejections under § 112, 2nd Paragraph

Paragraph 4 of the Action stated rejections of claims 1-10 and 14-18 under 35 U.S.C. § 112, 2nd paragraph, as being indefinite for failing to particularly point

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out and distinctly claim the subject matter which applicant regards as the invention. More particularly, the Action stated that claims 1-10 and 14-18 were incomplete for omitting essential cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. The rejection cited MPEP § 2172.01. The Applicant respectfully traverses these rejections.

For convenience of discussion, the Applicant reproduces MPEP § 2172.01 here:

2172.01 Unclaimed Essential Matter [R-1]

A claim which omits matter disclosed to be <u>essential</u> to the invention <u>as described in the specification or in other statements of record</u> may be rejected under 35 U.S.C. 112, first paragraph, as not enabling. *In re Mayhew*, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976). See also **MPEP § 2164.08(c)**. Such essential matter may include missing elements, steps or necessary structural cooperative relationships of elements <u>described by the applicant(s)</u> as necessary to practice the invention.

In addition, a claim which fails to interrelate <u>essential</u> elements of the invention <u>as defined by applicant(s) in the specification</u> may be rejected under 35 U.S.C. 112, second paragraph, for failure to point out and distinctly claim the invention. See *In re Venezia*, 530 F.2d 956, 189 USPQ 149 (CCPA 1976); *In re Collier*, 397 F.2d 1003, 158 USPQ 266 (CCPA 1968). >But see *Ex parte Nolden*, 149 USPQ 378, 380 (Bd. Pat. App. 1965) ("[I]t is not essential to a patentable combination that there be interdependency between the elements of the claimed device or that all the elements operate concurrently toward the desired result"); *Ex parte Huber*, 148 USPQ 447, 448-49 (Bd. Pat. App. 1965) (A claim does not necessarily fail to comply with 35 U.S.C. 112, second paragraph where the various elements do not function simultaneously, are not directly functionally related, do not directly intercooperate, and/or serve independent purposes.).<

The first paragraph of MPEP § 2172.01 pertains to rejections under § 112, first paragraph, for lack of enablement. The second paragraph of MPEP § 2172.01 pertains to rejections under § 112, second paragraph, for indefiniteness. Nevertheless, the underlined portions of both paragraphs refer to matter or elements that are described or defined by the applicant as being "essential" to the

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invention. These descriptions may appear in the applicant's specification, or in other statements of record. However, the Applicant submits that neither the Applicant's specification nor any statements on record (for example, the appeal brief) describe or define any subject matter as being "essential". On at least this basis, the Applicant requests reconsideration and withdrawal of the § 112, 2nd paragraph, rejections of claims 1-10 and 14-18.

In addition to the foregoing comments, the Applicant reproduces **independent claim 1** here for convenience, as it would stand after entry of the above redlines. Portions of claim 1 are italicized for ease of reference:

"1.   (Currently Amended)   A machine-readable medium having a data structure stored thereon for efficiently ordering a plurality of entities, the entities having respective ranks within a plurality of N ranks, the data structure comprising:

a horizontally linked list linking at least a subset of the *plurality of entities* in at least a descending rank order direction, the entities in the horizontally linked list having respective, unique ranks as compared to the ranks of other entities in the horizontally linked list; and,

an array having a plurality of fewer than N array entries over which the plurality of N ranks are distributed, such that the fewer than N array entries are associated with respective, corresponding ranges of the N ranks, wherein the ranges of the N ranks represent subsets of the N ranks, at least one of the N array entries *pointing to an entity of the plurality of entities* having a greatest rank within the range of ranks corresponding to the at least one array entry."

The Applicant submits that the italicized language in claim 1 above relates the linked list and the array. More specifically, "at least one of the N array entries [is] pointing to an entity of the plurality of entities" of the linked list.

On at least this further basis, the Applicant requests reconsideration and withdrawal of the § 112, 2nd paragraph, rejections of claim 1. Claims 2-9 depend from claim 1 and stand rejected under § 112, 2nd paragraph, on similar grounds. Thus, the comments directed to claim 1 apply equally to claims 2-9.

Turning to **independent claim 10**, the Applicant reproduces it here, as it would stand after entry of the above revisions. For ease of discussion, certain portions are italicized:

"10.   (Currently Amended)   A method implemented at least in part by a computing device for removing a particular entity from a plurality of entities, the entities having respective ranks within a plurality of N ranks, the method comprising:

in response to determining that *the particular entity is present within a vertically linked list* linking in at least one direction a corresponding subset of the plurality of entities having an identical rank, the corresponding subset including the particular entity, delinking the particular entity from the vertically linked list;

in response to determining that *the particular entity is present within a horizontally linked list* linking at least a subset of the plurality of entities in at least in a descending rank order direction, the subset including the particular entity, delinking the particular entity from the horizontally linked list; and,

in response to determining that *an array entry* of a plurality of fewer than N array entries of an array over which the plurality of N ranks are distributed *points to the particular entity,* adjusting the array entry to point to one of null and another one of the plurality of entities."

The Applicant submits that the vertically linked list, the horizontally linked list, and the array, as recited in claim 10, are related to one another by the "particular entity" feature. More specifically, the "particular entity" is present in the vertically linked list and in the horizontally linked list, and an array entry points to the "particular entity".

On at least this basis, the Applicant requests reconsideration and withdrawal of the § 112, 2nd paragraph, rejection of claim 10. Claims 14-18 depend from claim 10 and stand rejected under § 112, 2nd paragraph, on similar grounds. Thus, the comments directed to claim 10 apply equally to claims 14-18.

Rejections under § 103

Paragraph 6 of the Action stated rejections of claims 1-22 under § 103(a) as being unpatentable over a document entitled "Object Oriented Design for a Distributed Priority Queue" (hereinafter, "Lee"), in view of U.S. Patent No. 5,872,938 to Williams (hereinafter, "Williams"). The Applicant respectfully traverses these rejections.

Turning first to **independent claim 1**, without conceding the propriety of the stated rejections, and solely to advance the prosecution of this matter, the Applicant has amended claim 1 to clarify features of the machine-readable medium. For convenience of discussion, the Applicant reproduces claim 1 here, with revisions shown in redline:

> "A machine-readable medium having a data structure stored thereon for
>
> efficiently ordering a plurality of entities, ~~each~~ the entit~~ies~~y having ~~a~~ respective
>
> rank~~s~~ within a plurality of N ranks, the data structure comprising:
>
> a horizontally linked list linking at least a subset of the plurality of
>
> entities in at least a descending rank order direction, ~~each~~ the entit~~ies~~y in the
>
> horizontally linked list having ~~a~~ respective, unique rank~~s~~ as compared to the
>
> ranks of other entities in the horizontally linked list; and,

an array having a plurality of fewer than N array entries over which the

plurality of N ranks are distributed, such that each the fewer than N array entries

has are associated with a respective, corresponding ranges of the N ranks,

wherein the ranges of the N ranks represent subsets of the N ranks, at least one of

the N array entries each pointing to an entity of the plurality of entities having a

greatest rank within the corresponding range of ranks corresponding for to the at

least one array entry."

The Applicant submits that the above revisions are supported under 35 U.S.C. § 112, 1st paragraph, at least by Figure 1 and related description appearing at page 4, lines 10-15 of the specification. For example, as described at page 4, lines 10-15 of the specification, there may be 256 ranks and 8 array entries, with the ranks distributed equally among the array entries. In this instance, the integer N as recited in claim 1 would take the value of 256.

Turning to the cited art, the Applicant agrees with the assessment on page 9 of the Action that Lee does not allude to the data structure being stored on a medium and the table as an array having a plurality of array entries over which the ranks are distributed wherein at least one array entry each point to an entity of the plurality of entities having greatest rank within the range of ranks. Thus, the Action cited Williams for this teaching. However, in addition to the features indicated as missing from Lee on page 9 of the Action, the Applicant submits that Lee does not teach or suggest "an array having a plurality of fewer than N array entries over which the plurality of N ranks are distributed", as recited in claim 1.

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Turning to the secondary reference, Williams, without conceding that Williams provides the teaching for which it is cited in the Action, the Applicant submits that Williams also does not teach or suggest "an array having a plurality of fewer than N array entries over which the plurality of N ranks are distributed", as recited in claim 1.

In Figure 1, for example, Williams provides a table 104 that contains N pointers. Williams also provides a plurality of N queue elements 108, each of which is associated with a priority counter field 112. The Applicant submits that Williams teaches that the number of pointers in the table 104 ("N") is equal to the number of different priorities ("N") that are reflected in the queue elements 108. Therefore, the Applicant submits that Williams does not teach or suggest "an array having a plurality of *fewer than N* array entries over which the plurality of N ranks are distributed".

Based at least on the foregoing, the Applicant submits that Lee and Williams do not support a § 103 rejection of claim 1, whether considered severally or in combination. The Applicant thus requests reconsideration and withdrawal of the § 103 rejection of claim 1.

Claims 2-9 depend from claim 1, and stand rejected on similar grounds. Therefore, the comments directed above to claim 1 apply equally to claims 2-9.

Turning to **independent claim 10**, the Applicant has amended this claim to clarify features similar to those discussed above in claim 1. Thus, the comments directed above to claim 1 apply equally to claim 10. On at least this basis, the

Applicant requests reconsideration and withdrawal of the § 103 rejection of claim 10.

Claims 11-18 depend from claim 10, and stand rejected on similar grounds. Thus, the comments directed above to claim 10 apply equally to claims 11-18.

Turning to **independent claim 19**, the Applicant has amended this claim to clarify features similar to those discussed above in claim 1. Thus, the comments directed above to claim 1 apply equally to claim 19. On at least this basis, the Applicant requests reconsideration and withdrawal of the § 103 rejection of claim 19.

Claims 20-22 depend from claim 19, and stand rejected on similar grounds. Thus, the comments directed above to claim 19 apply equally to claims 20-22.

Certain dependent claims are amended as indicated above to address informalities noted by the Applicant.
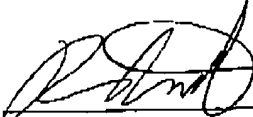
Conclusion

The Applicant respectfully requests reconsideration and favorable action on this application at the earliest convenience of the Office. Should any issue remain that prevents immediate issuance of the application, the Examiner is requested to contact the undersigned attorney to arrange a telephone interview.

Respectfully Submitted,

Dated: _2 AUG 06_   By: _____

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